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COMMENT

Comment on the letter of the Society of Vertebrate Paleontology (SVP) dated April 21, 2020 regarding "Fossils from conflict zones and reproducibility of fossil-based scientific data": Myanmar amber

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Motivation for this comment

Recently, the Society of Vertebrate Paleontology (SVP) has sent around a letter, dated 21st April, 2020 to more than 300 palaeontological journals, signed by the President, Vice President and a former President of the society (Rayfield et al. 2020). The signatories of this letter request significant changes to the common practices in palaeontology. With our present, multi-authored comment, we aim to argue why these suggestions will not lead to improvement of both practice and ethics of palaeontological research but, conversely, hamper its further development. Although we disagree with most contents of the SVP letter, we appreciate this initiative to discuss scientific practices and the underlying ethics. Here, we consider different aspects of the suggestions by Rayfield et al. (2020) in which we see weaknesses and dangers. It is our intent to compile views from many different fields of palaeontology, as our discipline is (and should remain) pluralistic. This contribution deals with the aspects concerning Myanmar amber. Reference is made to Haug et al. (2020a) for another comment on aspects concerning amateur palaeontologists/citizen scientists/private collectors.

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"Blood" amber

The SVP letter rightly raises concerns over the recently highlighted issue of 'blood amber' from Myanmar in the context of "fossils in and from conflict zones" (Rayfield et al. 2020: p. 1), based on popular articles that appeared in the *New Scientist* (Lawton 2019), *Science* (Sokol 2019) and *New York Times* (Joel 2020) (Side note: 'blood amber' is originally the English translation of the Chinese word 'xuepo' for red amber, e.g. Unschuld and Zheng 2012: p. 1161. Later, it has been associated with the tragic events in Myanmar, for example, through the documentary "Blood Amber" by Yong Chao Lee from 2017). We are indeed very concerned with the tragedy in Myanmar. However, there are some misconceptions and confusion surrounding amber from Myanmar, which we believe are not accurately addressed by the SVP letter. We are also dismayed by the misrepresentation of some views (such as Peretti 2020).

In the SVP letter, it is stated that "Our understanding is that the Myanmar military has recently seized control of the mining operation, causing armed conflict and ethnic strife in the country where the 'offensive killed and displaced thousands of people [forcing them to live in makeshift camps without aid] and has been condemned by the UN as a genocide and crime against humanity'" (Rayfield et al. 2020: p.

1). We are deeply concerned with the humanitarian situation in Myanmar and think that a response from the palaeontological community is clearly warranted. In this respect we very much agree with this sentiment expressed in the SVP letter. We have looked more deeply into this issue to understand the actual situation in Myanmar and what it means for palaeontological science.

The deeply disturbing United Nations Human Rights Council (UNHRC or HRC) report on *The economic interests of the Myanmar military*, published September 2019, states: "Since November 2017 the Tatmadaw [Myanmar Armed Forces; note from authors] and the KIA [Kachin Independence Army; note from authors] have engaged in armed conflict around the amber and gold mines near Noije Bum hill, south of Tanai town, resulting in civilian casualties. The Mission documented numerous accounts of violations of international human rights and international humanitarian law perpetrated by the Tatmadaw in Tanai, Kachin State" (Human Rights Council 2019: p. 32/33). What is clear from the report is that amber is not the only gem to be affected, but also ruby and jade are (see Lin et al. 2019 for details on jade mining). Nevertheless, we cannot ignore and do condemn the human suffering perpetrated in Kachin State since 2017. At time of writing, Lin Lin Oo, Member of Parliament for Tanai, is seeking to relieve the local economy by general reopening of the amber mines closed over two years ago by the Tatmadaw (Kachin News Group 2020).

Here we must emphasize that Tanai in Kachin State is not the only source of Burmese amber. Amber is now also found in Tilin, Magway Region and Khamti, Sagaing Region, all of which are not conflict areas (see Zheng et al. 2018 for details on the age and geographic location of these mines). In these latter areas, the miners have governmental permits from the Myanmar Gems Enterprise, their amber is legally traded at the biannual Myanmar Gems Emporium and tax is paid to the government (anonymous official in Myanmar, pers. comm.; yet, this does not suggest that there is no legal amber trade from Kachin State). These legal and conflict-free ambers would therefore also be covered by an outright ban on all ambers from Myanmar.

The authors of the SVP letter further state, that "the recent surge of exciting scientific discoveries, particularly involving vertebrate fossils, has in part fuelled the commercial trading of amber. The rarest types of fossils are sought after for exceptionally high prices" (Rayfield et al. 2020: p. 1). This is probably true wherever fossils are traded, amber is not exempt or alone in this fossil trade. We have to acknowledge this across palaeontology. While it is true that the discoveries of vertebrate remains (e.g. Daza et al. 2016; Xing et al. 2016, 2018a, b) caught international attention for both scientists and traders, the vast majority of traded Burmese amber does not contain extraordinarily preserved vertebrate remains that could be (and are) sold for thousands of US dollars, but contains mostly smaller specimens that are usually sold for far less than 100 dollars and as popular amber jewellery. Vertebrates in this type of amber only account for 0.3% of described species whereas arthropods account for 93% (Ross 2020). The number of inclusions already in circulation prior to 2017 is estimated at $>3\times10^5$ (Jarzembowski et al. 2016). Nevertheless, these smaller and cheaper specimens often contain very important scientific information, irrespective of their low commercial value. Many specimens with inclusions of scientific relevance end up in private collections, which potentially makes them no longer available to scientists (though not necessarily, see Haug et al. 2020a), so it is important for scientific institutions to acquire specimens for research or otherwise they may be lost for research indefinitely.

It appears a bit arbitrary to concentrate on events surrounding Myanmar amber in the SVP letter, because "[t]here are fossils from other areas of concern" (Rayfield et al. 2020: p. 1) as well. If the palaeontological community would wish to act against research on fossils from conflict zones, a considerable number of other areas would have to be included. Other ambers, e.g. Rovno amber from western Ukraine, are also associated with the violation of human rights, environmental destruction and illegal trade (Piechal 2017). Despite active studies performed on this deposit, these issues do not seem to attract the same amount of attention. Currently, Myanmar is in a way pilloried. The situation in Myanmar is complicated though the country is working towards peace (see Woods 2019) and according to the Global Peace Index 2019 published by the Institute for Economics and Peace (2019), Myanmar is now considered more peaceful than, for example, the USA. Generally, this also raises the question of who should assess suitable political and social circumstances of fossil (or extant) material for scientific study. Who decides which governments and nations should be boycotted today? What ethical standards should be applied? Such decisions should be broadly supported instead of unilaterally imposed, and perhaps the SVP should strive to develop an ethics code amongst its members to decide where the boundaries lie for palaeontological studies, regardless of political motivation, influence or agenda.

Retrospective moratorium on Myanmar amber

The SVP letter recommends a moratorium on the publication of papers on Burmese amber based on recently acquired material dating back to June 2017. *Acta Palaeontologica Polonica* (APP) has taken this on board and is now not considering any papers on Burmese amber collected from 2017 onwards (https://app.pan.pl/news.html). The *Journal of Systematic Palaeontology* (JSP) has gone a stage

further and will "no longer consider manuscripts that are based wholly, or in part, on material included within Myanmar (Burmese) amber, whether in historic collections or obtained from more recent sources" (Barrett and Johanson 2020). However, these general bans on all Burmese amber do not reflect the reported situation in Myanmar. The United Nations Human Rights Council (HRC) report indicated that the military troubles in the amber mines area of Kachin State started in November 2017 (Human Rights Council 2019: p. 32). Furthermore, at least amber from Tanai mined before November 2017 and from Khamti, which is mined legally and with the necessary permits, should not be affected by any moratorium. As the overall situation in Myanmar is still partly unclear, there may still be also legal mining in Kachin State. As palaeontologists, we must acknowledge the history of our palaeontological collections, but how do we want to apply bans on legally collected specimens?

The majority of amber researchers were not aware of the issues in the area until information was disseminated at the *8th International Conference on fossil insects, arthropods and amber* in April 2019, or read about it in the articles published shortly afterwards in the *New Scientist* and *Science*. Even if we could agree on a moratorium for stopping research on a specific type of fossils, this cannot be done retrospectively as requested in the SVP letter. In many cases it will be impossible to prove when specimens have been acquired, partly as they often change hands several times until a scientist works on them. A way forward is perhaps to buy amber only from the Myanmar Gems Emporium and authorised dealers, or if there is documented evidence that the amber was mined prior to November 2017. Yet, it might prove difficult for resellers to retrospectively show that they have acquired their ambers via this source. The HRC report (2019: p. 66) has the following recommendation:

> "Any business enterprise purchasing natural resources from Myanmar highlighted in this report, and in particular, jade and rubies, and timber from Kachin and Shan States, should conduct heightened due diligence to ensure that the resources were not produced or sold by enterprises owned or influenced by the Tatmadaw (including subsidiaries and joint ventures) or individual members of the Tatmadaw. If so, they should not purchase or use, directly or indirectly, the resources."

Especially the aspect of the moratorium being retrospective is harmful to science. There are running research projects predominantly funded by tax money that need to provide certain achievements for the funders; there are manuscripts prepared representing months and often years of work; there are large-scale studies and review papers prepared that utilise hundreds of specimens from different worldwide sources (not just Burmese amber); there are project proposals submitted; there are probably even entire careers dedicated to a specific type of fossil with major records from Burmese amber or organisms for which Burmese amber provides the only source of well-preserved Cretaceous fossils. The impact of such a moratorium would be especially harmful to the work of early career researchers, including PhD students, as it might very well derail the entirety of their dissertation work but also impose a further bureaucratic layer that both early career scientists and those without institutional backup will not be able to handle. To ask for a moratorium retrospectively will greatly affect all of these interests. This approach would not only be detrimental for many scientific projects and researchers, but presumably legally challengeable and possibly untenable.

Does the letter by the Society of Vertebrate Paleontology reflect the opinion of most palaeontologists?

Although the Society of Vertebrate Paleontology (SVP) is a well-respected society with many members, it is mainly a North American-focused organisation that concentrates only on fossil vertebrates. Hence, its focus is to a certain extent geographically and systematically restricted and it does not speak for the entire palaeontological community. Indeed, the SVP membership had no prior knowledge of the letter until it was distributed and subsequently posted on the SVP website as a *fait accompli*. Nonetheless, the requests of the SVP addressed to more than 300 palaeontological journals worldwide affect all fields of palaeontology and all geographic regions. Therefore, the requests of the SVP ignore the traditions and reality of palaeontological practice in other fields of research outside vertebrate palaeontology. The SVP's recommendation for a moratorium on Burmese amber affects fossil non-vertebrate research much more than fossil vertebrate research and clearly does not represent this part of the palaeontological community.

Conclusions

Science serves to extend the knowledge of humankind. With Burmese amber as one of the most important windows into the Cretaceous Period currently available (examples in Fig. 1), not examining, evaluating and publishing it would mean withholding knowledge about history of life on Earth. It is self-evident from our argumentation that the situation surrounding Burmese amber is not as simple as the SVP letter suggests. A general moratorium on fossils from this type of amber is not justified by the facts presented, e.g. in the HRC report, and is unlikely to improve the situation in Myanmar. It will instead have a very negative impact on practical research, scientists, the institutions that support

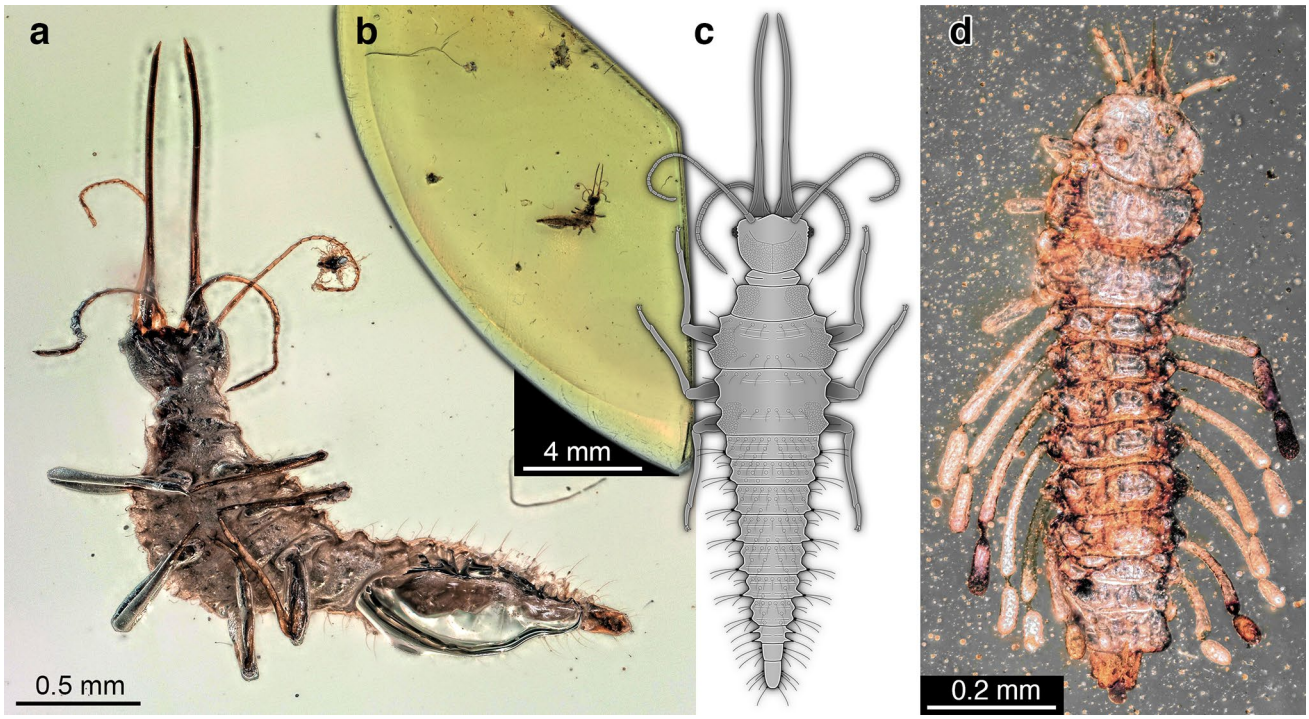

Fig. 1 Burmese amber is an invaluable source of scientifically important organisms, including many examples for which no other fossil source yields comparable specimens with remarkable preservation and exceptional morphology. **a–c** A lacewing larva (Neuroptera) with extremely elongated mouthparts unparalleled in any other time period (Haug et al. 2019, re-figured under CC BY 4.0); the specimen of Kachin amber was legally acquired and originally part of the collection of Patrick Müller; it was later donated to the Staatliches Museum für Naturkunde Stuttgart (SMNS BU-355). **a** Entire specimen in ventral view. **b** Amber piece including the specimen. **c** Restoration drawing in dorsal view. **d** Extremely unusual holometabolan larva in dorsal view; the character combination is so unusual that we cannot even tell whether this specimen represents a lacewing or a beetle or something closely related to both (Haug et al. 2020b, re-figured under CC BY 4.0); the specimen of Kachin amber was legally acquired and originally part of the collection of Patrick Müller; it was later donated to the Staatliche Naturwissenschaftliche Sammlungen Bayerns—Bayerische Staatssammlung für Paläontologie und Geologie in Munich (SNSB-BSPG 2019 I 171)

them, and even the community in Myanmar that makes a living from harvesting these ambers. For these reasons, we suggest that the editors of palaeontological journals should not follow the requested moratorium on Burmese amber as formulated in the SVP letter, in particular as its proposals are not unanimous amongst the community and merely a start of a discussion on ethics that is only just beginning within the community. The requests formulated by representatives of an association of vertebrate palaeontologists, in a seemingly rushed manner, could have extremely negative effects on the investigation of other groups of organisms, like for instance arthropods, which comprise about 93% of the described fauna (Ross 2020). For certain groups of organisms, Burmese amber is virtually the only source of well-preserved information from the Cretaceous (e.g. leafy liverworts; Heinrichs et al. 2018). If there was a total ban on Burmese amber-related publications, even those using historical collections, important data of this time slice would no longer be accessible. A broad discussion involving researchers working on very different systematic groups occurring in Burmese amber as well as local stakeholders is instead crucial to find a strategy how to deal with these types of fossils.

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